NATURAL RESOURCES CONSERVATION SERVICE

VIRGINIA CONSERVATION PRACTICE STANDARD

IRRIGATION REGULATING RESERVOIR

(No.)

CODE 552

DEFINITION

A small storage reservoir constructed to regulate an irrigation water supply.

PURPOSE

Collect and store water for a relatively short period of time to:

- Improve irrigation water management by regulating fluctuating flows in streams, canals, or from pumping plants.
- Provide storage for tailwater recovery and reuse.
- Improve offsite water quality.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to reservoirs created by impoundment structures and excavated pits for short-term storage of diverted surface water, water from pumped or flowing wells, or water from an irrigation delivery system. This standard applies to structures designed primarily for flow control or those designed to store water for only a few hours or a few days.

This standard applies to sites meeting the following applicable conditions:

1. The existing available irrigation stream is of such size that regulation is necessary to accomplish the intended purposes. For example, low yield irrigation wells where collection facilities are needed for efficient irrigation application.
2. Water must be stored to be used between times of rotation delivery.
3. An adequate and dependable volume of good quality water is or can be made available by storage.
4. Topographic, geologic and soil conditions are suitable for practical construction of a regulating reservoir having adequate storage capacity, and any pervious soils in the reservoir area can be sealed to ensure seepage losses are not excessive.
5. If surface runoff enters the reservoir, the contributing drainage area is or can be protected against erosion so that normal sedimentation does not materially shorten planned reservoir life.

This standard pertains to the planning and functional design of irrigation regulating reservoirs. It does not include detailed design criteria or construction specifications for individual regulating reservoirs or components of the regulating facility.

This standard also applies to regulating reservoirs constructed of concrete, steel, and other suitable materials used to collect water from two or more irrigation wells for use in irrigation systems.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

CRITERIA

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

Criteria for design of components not addressed in Virginia Conservation Practice Standards shall be consistent with sound engineering principles.

Installation and operation of irrigation regulating reservoirs shall comply with all federal, state, and local laws, rules and regulations.

Irrigation regulating reservoirs created by earthen pits or embankments shall be designed and constructed according to Virginia Conservation Practice Standard *Pond (Code 378)*.

Regulating reservoirs constructed of materials other than earth shall be designed according to sound engineering principles for the material being used.

Pumping plants installed to serve irrigation regulating reservoirs shall be designed and constructed according to Virginia Conservation Practice Standard *Pumping Plant (Code 533)*.

Where additional storage is required to provide for sediment deposition, storage facilities shall be sized accordingly. Allowable retention times shall be site specific to the particular soil type(s).

ADDITIONAL CRITERIA APPLICABLE TO REGULATING FLUCTUATING FLOWS IN STREAMS, CANALS, OR FROM PUMPING PLANTS

Capacity

Irrigation regulating reservoirs shall have a usable capacity sufficient to permit the existing irrigation stream to be regulated so that irrigation water can be applied with a reasonably high efficiency. In computing capacity requirements, consideration shall be given to diverted inflow, surface runoff, precipitation, evaporation, and seepage, as applicable. Excessive seepage losses shall be prevented by the use of Virginia Conservation Practice Standards for *Pond Sealing or Lining (Codes 521A, 521B, 521C)* or concrete. Additional capacity shall be provided, as necessary, for sediment storage.

Capacity requirements for regulating reservoirs used as part of a system for collecting water from two or more wells shall be based on the discharge capacities of the contributing wells and on the operation frequency of the irrigation system.

Inlet Protection

Reservoir embankment or excavated side slopes at inlets shall be protected from erosion by use of pipe inlets or other suitable structures. Inlet structure capacity shall be adequate to accommodate the design inflow rate.

Overflow Protection

An overflow protection structure having a capacity equal to or greater than the inlet stream shall be provided for an enclosed embankment. This structure may be designed and installed in combination with the outlet works.

Outlet Works

Outlet works shall be provided for the controlled release of irrigation water. The outlet works may consist of a gated conduit through or over the embankment for gravity flow to the irrigated area or to a pumping plant. They may also consist of a pumping plant designed to lift water directly from the reservoir basin.

The capacity of the outlet works shall be adequate to provide the outflow rate needed to meet peak period irrigation system demands.

ADDITIONAL CRITERIA APPLICABLE TO STORAGE FOR TAILWATER RECOVERY AND REUSE

Irrigation regulating reservoirs used in irrigation tailwater recovery and reuse systems are often referred to as tailwater pits or sumps.

Capacity

Capacity requirements for irrigation regulating reservoirs for tailwater recovery shall be based on irrigation system runoff volume and rate and the required level of water control at the point tailwater is returned to the irrigation system. Excessive seepage losses shall be prevented by the use of an adapted method of sealing or lining.

For systems where tailwater is discharged into an irrigation pit, regulating reservoir, or pipeline having facilities for regulating fluctuating flows (e.g. a float valve), small pits or sumps with frequently cycling pumping plants may be used. For systems unable to regulate flows, tailwater sumps or pits shall be made large enough to provide the regulation needed to permit efficient use of the water.

When energy sources for tailwater pump-back systems are subject to interruption, safe emergency bypass areas cannot be provided, or tailwater discharges violate local or state regulations, tailwater storage requirements shall, as a minimum, include a volume adequate to store the complete runoff from a single irrigation set.

Inlet Protection

Sumps and pits shall be equipped with inlets designed to protect side slopes and collection facilities from erosion. A dike, ditch, or water control structure shall be provided, if required by state law, to limit the entrance of rainfall runoff into the designed inlet. Sediment traps shall be installed as needed.

ADDITIONAL CRITERIA APPLICABLE TO IMPROVING WATER QUALITY

Capacity

Where additional storage and/or flow regulation is required to provide adequate retention time for breakdown of chemicals in runoff waters, storage facilities shall be sized accordingly. Allowable retention times shall be site specific to the particular chemical of concern.

Seepage from irrigation regulating reservoirs shall be controlled to the extent practical when the facility is expected to receive chemical-laden waters. Control may be in the form of natural soil liners, soil additives, commercial liners, or other approved methods.

Inlet Protection

Reservoir embankment or excavated side slopes at inlets shall be protected from erosion by use of pipe inlets or other suitable structures. Inlet structure capacity shall be adequate to accommodate the design inflow rate.

CONSIDERATIONS

When planning this practice, the following items should be considered, as applicable:

The potential for irrigation water management should be considered.

Effects of erosion and the movement of sediment, pathogens, and the soluble and sediment-attached substances carried by runoff should be assessed.

Short-term and construction-related effects on quality of downstream watercourses should be considered.

The potential of uncovering or redistributing toxic material should be assessed.

Consider the effects on the water budget, especially on volume and rate of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

Effects on downstream flows or aquifers that would affect other water uses or users should be assessed.

Consider the movement of dissolved substances to groundwater.

Evaluate the effects on wetlands or water-related wildlife habitats. Wetland investigations and documentation should be performed according to existing policy.

There may be effects on cultural resources.

PLANS AND SPECIFICATIONS

Plans and specifications for irrigation regulating reservoirs shall be in keeping with this standard and shall describe the requirements for properly installing the practice to achieve its intended purpose.

DESIGN DATA

As a minimum, record and maintain the following planning and design data. Include this information on either the drawings, on approved forms, or on the Engineering Field Book, as appropriate.

1. Completed Form VA-EE-1.
2. Location map. Include tract number, field numbers, and acreage in field(s). Include the location of the reservoir in relation to an identifiable point.
3. All design data required in the Virginia Conservation Practice Standard *Pond (Code 378).*
4. All design data required by other Virginia Conservation Practice Standards such as *Pumping Plant (Code 533).*
5. Volume calculations.
6. Method of spoil disposal.
7. Engineering Layout Surveys.
8. Structures, where applicable.
9. Soil borings.
10. Liner design, where applicable.
11. Outlet conditions.
12. Cross-references to appropriate engineering field books will be made on drawings and plans.
13. Recommendations for revegetation.
14. Irrigation Water Management Plan (Virginia Conservation Practice Standard *Irrigation Water Management (Code 449)).*
15. Environmental Evaluation Form VA-EE-1.

CHECK DATA

As a minimum, record and maintain the following check data:

1. As-built cross-sections and inlet and outlet information.
2. Check data for Virginia Conservation Practice Standards used in plan.
3. Data on all structures installed.
4. Certification that practice meets Standards and Specifications. Note any exceptions.
5. A statement that the following have been satisfactorily completed:

   a) Spoil spreading
   b) Seeding or successful establishment of vegetation

6. Completed list of Operation and Maintenance requirements.

OPERATION AND MAINTENANCE

Operation and Maintenance Requirements specific to the facility installed shall be prepared for use by the landowner or operator. The plan should provide specific instructions

for operating and maintaining facilities to ensure they function properly. The plan shall include provisions to address the following, as a minimum:

- Periodic cleaning and re-grading of collection facilities to maintain proper flow lines and functionality.
- Periodic checks and removal of debris as necessary from inlet and outlet structures to assure proper operation.
- Periodic removal of sediment from traps and/or storage facilities to maintain design capacity and efficiency.
- Inspection or testing of all pipelines and pumping plant components and appurtenances, as applicable.
- Routine maintenance of all mechanical components in accordance with manufacturer recommendations.
- Periodic inspection and maintenance of embankments including control of erosion and undesirable vegetation.
- Periodic water quality analysis as necessary to evaluate nutrients, pesticides, and pathogens.

REFERENCES

1. NRCS, National Engineering Handbook, Sections 5, 11, 17.
2. NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook, Chapters 2, 4, 11, 15, and 17.
3. Wetlands Local-State-National Joint Permit Application.
4. “USGS, Dept. of Interior, Average Annual Runoff in the United States, 1951-80”.
5. NRCS, Virginia Field Office Technical Guide (FOTG), Section IV.

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Approved Practice Narrative

(No.)

CODE 552

552 D1 Irrigation Regulating Reservoir: An irrigation regulating reservoir shall be installed to regulate an irrigation water supply by storing water until it can be used beneficially to satisfy crop irrigation requirements.

NRCS, VA, August 2003